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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/372,636 08/11/99 HORNSCHEMEYER W 364/56

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IM22/1201

EXAMINER

KERNS, K

ART UNIT

PAPER NUMBER

1722

DATE MAILED:

12/01/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trad marks

Office Action Summary

Application No.

09/372,636

Applicant(s)

HORNSCHEMEYER ET AL.

Examiner

Kevin P. Kerns

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claims ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 August 1999 is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

DETAILED ACTION

Drawings

1. This application, filed under former 37 CFR 1.60, lacks formal drawings. The informal drawings filed in this application are acceptable for examination purposes. When the application is allowed, applicant will be required to submit new formal drawings. In unusual circumstances, the formal drawings from the abandoned parent application may be transferred by the grant of a petition under 37 CFR 1.182.
2. The drawings are objected to because there is no representation of depth "d" of the cooling grooves in Figure 2. In Figure 1, there are extraneous diagonal lines just to the left of Ref. 5. The 200 mm section (above the 50 mm transitional zone 8 in Figure 1) is not identified. Correction is required.

Specification

3. The disclosure is objected to because of the following informalities: on page 2, line 4, "for one thing" should be deleted. On page 2, lines 6 and 7, "For another thing" should be changed to "Moreover" (or another similar word). On page 2, line 7, "that are aimed at" should be deleted, and "targeted" (or another similar word) should be added before "higher". On page 2, line 18, "For one thing" should be changed to "Moreover" (or another similar word). On page 3, line 33, "the" (before "more") should be deleted. On page 5, line 12, "also" should be moved from after to before the word "increased". On page 6, line 4, "this" should be deleted. Corrections and/or clarifications are required for these and other errors that occur throughout the specification.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "high heat conductivity" in claim 1 is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The term "narrower" in claim 12 is a relative term which renders the claim indefinite. The term "narrower" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. There is no reference as to what the thermally and mechanically stressed areas are configured.

The term "gradually narrower" in claim 14 is a relative term which renders the claim indefinite. The term "gradually" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim 1 recites the limitation "the surface" in the last line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 3 recites the limitations "narrow side walls" and "the width of the billet". There is insufficient antecedent basis for these limitations in the claim.

Claim 4 recites the limitations "the cross-section" and "the billet-exit-side end". There is insufficient antecedent basis for these limitations in the claim.

Claims 4 and 5 recite the limitation "the pouring-in-side end". There is insufficient antecedent basis for this limitation in the claims.

Claim 5 recites the limitation "the pouring direction (GR)" in line 3 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claims 6 and 7 recite the limitations "the bath surface area", "the length", "the meniscus", and "the broad-side wall". There is insufficient antecedent basis for these limitations in the claims.

Claims 8 and 9 recite the limitations "the surface-related heat flow", "the more stressed area of the bath surface", and "the other areas of the bath surface". There is insufficient antecedent basis for these limitations in the claims.

Claim 10 recites the limitations "the wall thickness", "the pouring and cooling surface", and "the broad-side walls". There is insufficient antecedent basis for these limitations in the claim.

Claim 11 recites the limitations "the wall", "the pouring and the cooling surface", and "the bath surface area". There is insufficient antecedent basis for these limitations in the claim.

Claim 12 recites the limitation "the pouring direction" in lines 2 and 3 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 13 recites the limitations "the spacing of the coolant channels or cooling bore holes", "the horizontal adjoining areas", and "the bath surface". There is insufficient antecedent basis for these limitations in the claim.

Claim 14 recites the limitation "the coolant channels or the cooling bore holes" in lines 1 and 2 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim 15 recites the limitations "the coolant channels" and "cooling bore holes". There is insufficient antecedent basis for these limitations in the claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. Claims 1-5 are rejected under 35 U.S.C. 102(a) as being anticipated by Stagge et al. (WO97/43063). Stagge et al. teach a liquid-cooled chill mold (casting die) with a form-giving casting die body (page 4, lines 18-23; and Figure 1), which is made of a material of high-heat conductivity, namely copper (page 2, lines 3-11; page 5, lines 8-9; and Figure 3). The cooling-surface side of the chill mold, comprised of a cooling zone with multiple cooling channels for greater heat flow dissipation, is oriented on the sides of the mold with the thermally and mechanically stressed areas of the mold (page 3, lines 1-18 and 21-26; page 5, lines 14-16; and Figures 2-4). The liquid-cooled chill mold (casting die) includes a cavity that is composed of two broad-side walls and narrow-side

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walls delimiting the width of the slab, or billet (page 4, lines 18-23; and page 5, lines 1-7). The cross-section of the mold at the pouring-in-side end is greater than at the billet-exit-side end, or of a descending funnel shape with a hollow cavity becoming smaller in the pouring direction (page 4, lines 1-3; and Figure 1).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stagge et al. (WO97/43063) in view of Klein et al. (US 5,095,970). Stagge et al. teach a liquid-cooled chill mold (casting die) containing all elements mentioned in the above paragraph 7, as well as a cooling zone with multiple cooling channels for greater heat flow dissipation in the bath surface area (page 3, lines 1-18 and 21-26; page 5, lines 14-16; and Figures 2-4). Stagge et al. do not teach a cooling zone extending at least 20% (or 30-60%) of the length of the meniscus of the broad-side wall.

However, Klein et al. teach a cooling device along the height of the wide side of the mold cavity that extends approximately 55-75% of the height of the wide sides of the walls (column 1, lines 29-34; column 2, lines 67-68; column 3, lines 1-4; and Figures 1-4) for the purpose of uniform cooling of the metal strand product (column 1, lines 24-26).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to combine the liquid-cooled chill mold (casting die) of Stagge et al. with the cooling device of Klein et al. in order to obtain uniform cooling of the product (column 1, lines 24-26).

12. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stagge et al. (WO97/43063) in view of Hargassner et al. (US 5,117,895). Stagge et al. teach a liquid-cooled chill mold (casting die) containing all elements mentioned in the above paragraph 7. Stagge et al. do not teach a surface-related heat flow in the more

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stressed area of the bath surface that is 5-40% (or 10-20%) greater than in the other areas of the bath surface.

However, Hargassner et al. teach a variable heat transmission coefficient (α) between the internal plate and the coolant with values ranging between 20 and 70 kW/m²K, preferably between 25 and 50 kW/m²K (column 1, lines 51-59). The heat transmission coefficient is dependent on the coolant flow velocity and the width of the coolant ribs (column 3, lines 36-45 and 66-68; column 4, lines 1-17 and 55-61; the table in column 4; and Figures 5-8). These variables are optimized for the purpose of producing effective cooling of the internal casting mold plates (column 1, lines 37-50).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to combine the liquid-cooled chill mold (casting die) of Stagge et al. with the range of values of heat transmission coefficients, channel widths, and flow velocities (Figures 5 and 8) of Hargassner et al. to calculate the surface-related heat flow for improving cooling efficiency of the mold plates (column 1, lines 37-50).

13. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stagge et al. (WO97/43063) in view of Rode et al. (US 5,899,259). Stagge et al. teach a liquid-cooled chill mold (casting die) containing all elements mentioned in the above paragraph 7. Stagge et al. do not teach a wall thickness between the pouring and cooling surface that is reduced (by 1 to 6 mm) in the thermally and mechanically stressed areas of the broad-side walls.

However, Rode et al. teach a plating method that covers the wall thickness over the area of the height of the meniscus, and the thickness of the plating material on the

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broad-side walls diminishes from 3 mm to 1 mm for the purpose of improving the billet surface and microstructure quality (column 2, lines 6-8).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to combine the liquid-cooled chill mold (casting die) of Stagge et al. with the tapering wall thickness of Rode et al. in order to improve the billet surface and microstructure quality (column 2, lines 6-8).

14. Claims 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stagge et al. (WO97/43063) in view of Nakashima et al. (US 5,207,266). Stagge et al. teach a liquid-cooled chill mold (casting die) containing all elements mentioned in the above paragraph 7. Stagge et al. do not teach narrower configured coolant channels or cooling bore holes running parallel to the pouring direction with spacings of at least 20% less than in the horizontal adjoining areas of the bath surface in the transition area.

However, Nakashima et al. teach narrower configured coolant channels with regard to their spacings and widths (column 1, lines 47-61; column 4, lines 33-63; and Figures 2, 9, 11-13, and 16). These coolant channels are arranged in a parallel fashion in the thermally stressed area of the mold wall, as shown by the temperature gradients (Figures 11-13 and 16). The spacing of the coolant channels (as defined by the widths w , $1.5w$, and W) are at least 20% less than the horizontal adjoining area(s) of the surface in the transition (cooling) area(s) (Figures 2, 13 and 16). Additional coolant channels (bore holes) of varying widths and angles are situated between the surface coolant channels (Figure 9). The increased number of coolant channels are desired for the purpose of obtaining a more uniform cooling effect (column 1, lines 39-46).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to combine the liquid-cooled chill mold (casting die) of Stagge et al. with cooling channels of various spacings and widths taught by Nakashima et al. in order to achieve a more uniform cooling effect (column 1, lines 39-46).


Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The Grove et al., Sears, Jr. et al., Benedetti et al., Villanueva et al., Akiyoshi et al., and Stagge et al. references are cited to show the state of the art. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin P. Kerns whose telephone number is (703) 305-3472. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Y. Pyon can be reached on (703) 308-4251. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7718 for regular communications and (703) 305-3602 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

KPK
kpk
November 30, 2000


HAROLD PYON
SUPERVISORY PATENT EXAMINER
1722 11/30/00